

IN THE DRAWINGS

The attached sheets of drawings include changes to Figs. 1, 2 and 5-22. The attached sheets including Figs 1, 2 and 5-22, replace the original sheets including Figs. 1, 2 and 5-22.

REMARKS

The Office Action dated January 10, 2005 has been received and carefully noted. The above amendments to the drawings and claims, and the following remarks, are submitted as a full and complete response to the Office Action.

Claims 1, 5, 7, and 9 are amended to overcome objections to these claims and claim 17 is amended to overcome the rejection under 35 U.S.C. §112, second paragraph. Claims 3 and 4 are amended to change their dependency from claim 2 to claim 1, and claim 2 is cancelled. A Terminal Disclaimer is submitted and Replacement drawing sheets are attached. No new matter has been added. Claims 1-17 are respectfully submitted for consideration.

The Office Action objected to the drawings. Specifically, the Office Action required that Figures 1 and 2 be labeled as – Prior Art--. The Office Action further required that Figures 6-22 should be labeled with reference numbers to indicate the elements illustrated in these figures.

It is respectfully submitted that the attached replacement sheets obviate this objection by amending the drawings as requested in the Office Action. Accordingly, withdrawal of the objection to the drawings is respectfully requested.

The Office Action objected to claims 1-17 because of informalities. It is respectfully submitted that the amendments to claims 1, 5, 7, and 9 obviate this objection. Specifically, these claims are amended as suggested/required in the Office Action. Accordingly, withdrawal of the objection of these claims is respectfully requested.

The Office Action rejected claim 17 under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter of the invention.

It is respectfully submitted that claim 17 as amended, provides proper antecedent basis for the features recited in claim 17 and particularly points out and distinctly claims the subject matter of claim 17. Accordingly, withdrawal of the rejection of claim 17 under 35 U.S.C. §112, second paragraph is respectfully requested.

The Office Action provisionally rejected claims 1-17 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-5, 9 and 31 of co-pending application no. 10/774,691 to Lehtonen.

As discussed above, in accordance with 37 CFR 1.321(c), a duly executed Terminal Disclaimer is attached to overcome the provisional double-patenting rejection. Accordingly, withdrawal of the provisional double patenting rejection of claims 1-17 is respectfully requested.

The Office Action rejected claims 1, 2, 6, 7, 10 and 16-17 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 4,483,194 to Rudolf (Rudolf), or U.S. Patent No. 5,349, 858 to Yagi et al. (Yagi), or U.S. Patent No. 5,831,164 to Reddi et al (Reddi), or U.S. Patent No. 5,905,203 to Flach et al (Flach), or JP 5-142251 to Umeda (Umeda). The Office Action took the position that the features of these claims are disclosed in any of the above-mentioned prior art references. These rejections are respectfully traversed. The rejection of claim 2 is moot in light of the cancellation of claim 2, the subject matter of which is incorporated in claim 1.

Claim 1, upon which claims 3-17 depend, recites a capacitive acceleration sensor including at least one pair of electrodes such that each pair of electrodes includes a movable electrode, which is responsive to the acceleration, and at least one stationary plate portion, wherein each pair of electrodes further includes an axis of rotation essentially forming a common axis such that the movable electrode of the acceleration sensor is rigidly supported at the axis of rotation such that the movable electrode is free to turn in a rotational motion about the axis of rotation. Further, in the capacitive acceleration sensor a capacitance change between the movable electrode in rotational motion and the plate portion is enhanced by means of the electrodes. In the capacitive sensor, the capacitance change between the movable electrode in rotational motion and the plate portion is enhanced by means of the shape of the electrodes.

As discussed in the specification, an object of the present invention is to provide an improved sensor structure which improves the capacitive sensitivity of a pair of electrodes based on rotational motion and to measure acceleration with good performance in capacitive acceleration sensor designs.

Rudolf discloses integrated accelerometers comprising a flap fixed to a carrier by two attachment means. The accelerometer of Rudolf further discloses a fixed electrode deposited on a plate. When the device is subjected to acceleration perpendicular to the plane of the plate, the flap turns about its resilient attachment means until the return torque applied by the attachment means balances the movement produced on the flap by the acceleration. See Figure 1, column 2, lines 20-40 of Rudolf.

It is respectfully submitted that Rudolf fails to disclose or suggest all of the features recited in the pending claims. Specifically, Rudolf fails to mention the feature of a

capacitance change between the movable electrode and the plate portion when rotational motion on the plate portion is enhanced by means of the electrodes, as recited in claim 1. As discussed above, Rudolf merely discloses a fixed electrode deposited on a plate and a moveable flap (which is not an electrode). Thus, Rudolf fails to disclose or suggest all of the features of the pending claims.

Yagi discloses an angular acceleration sensor. Figure 2 of Yagi shows a rectangular planer weight (11) supported inside a frame-like base plate (13) by means of a support (12) at the midpoint of the longer sides of the weight (11). See column 2, lines 56-65 and Figures 1 and 2.

It is respectfully submitted that Yagi fails to disclose or suggest all of the features recited in the pending claims. Specifically, Yagi fails to disclose or suggest the feature of a capacitance change between the movable electrode in rotational motion and the plate portion and the plate portion is enhanced by means of the electrodes, as recited in claim 1. Yagi fails to mention, disclose or suggest this feature. Thus, Yagi fails to disclose or suggest all of the features recited in the pending claims.

Reddi discloses a linear and rotational accelerometer. As shown in Figure 3, Reddi discloses pairs of fixed electrodes 17-20, and an imbalanced bar, which are part of an imbalance sensing module 5. The imbalance sensing module 5 is used to provide a measurable and combined response to one axis of linear acceleration and one axis of rotational acceleration. The accelerometer disclosed in Reddi detects the displacement of the proof mass, and the proof mass is responsive to both angular and linear acceleration. See column 2, lines 33-39.

It is respectfully submitted that Reddi fails to disclose or suggest all of the features recited in claim 1. Specifically, Reddi fails to disclose or suggest that the movable bar is an electrode. Therefore, Reddi does not disclose a moveable electrode as recited in claim 1.

Further, although Reddi discloses that any shape of the bar (10) and the hinge 27 may be used, (see column 6, lines 29 and 30), Reddi fails to disclose or suggest the feature of a capacitance change between the moveable electrode in rotational motion and the plate portion is enhanced by means of the electrodes, as recited in claim 1. Thus Reddi fails to disclose or suggest all of the features recited in the pending claims.

Flach discloses a micromechanical acceleration sensor. The micromechanical acceleration sensor consists of a first semiconductor wafer and a second semiconductor wafer whereon the first semiconductor wafer that leads to a first electrode is provided to create a variable capacitance and the second semiconductor wafer has a moveable second electrode and whereon the first semiconductor there is a microelectronic evaluation unit. See Figure 8 and Column 3, lines 18-28.

It is respectfully submitted that Flach fails to disclose or suggest all of the features recited in the pending claims. Specifically, Flach fails to disclose or suggest the feature of a capacitance change between the movable electrode and rotational motion and the plate portion is enhanced by means of the electrodes, as recited in claim 1. In fact, Flach discloses that any enhancement of capacitive change is accomplished by the silicon wafers, which are not electrodes. See column 1 lines 30-39 of Flach. Thus, Flach fails to disclose or suggest all of the features recited in the pending claims.

Umeda discloses an angular acceleration sensor. Umeda discloses an acceleration sensor with a pair of moveable electrodes and corresponding fixed electrodes. The moveable electrodes are connected through a beam so that the square hollow parts can be rotated for a small angle around the axis of the beam. See the Abstract of Umeda.

It is respectfully submitted that Umeda fails to disclose or suggest all of the features recited in the pending claims. Specifically, Umeda fails to disclose or suggest the feature of a capacitance change between the movable electrode and rotational motion and the plate portion is enhanced by means of the electrodes, as recited in claim 1. In fact, it appears that Umeda fails to even contemplate this feature. Thus, Umeda fails to disclose or suggest all of the features recited in the pending claims.

Further, it is respectfully submitted that Rudolf, Yagi, Reddi, Flach and Umeda fail to disclose or suggest the feature wherein the capacitance change between the movable electrode in rotational motion and the plate portion is enhanced by means of the shape of the electrode, as recited in claim 1. In fact, this feature is not disclosed, suggested or even mentioned in the above-mentioned references, nor is this feature inherent in any of the cited references.

It is respectfully submitted that since claims 6, 7, 10 and 16-17 depend from claim 1, these claims are allowable at least for the same reasons as claim 1.

It is respectfully submitted that the cited references fail to disclose or suggest all of the features recited in claims 1, 6, 7, 10 and 16-17. Accordingly, withdrawal of the rejection of these claims under 35 U.S.C §102 (b) is respectfully requested.

The Office Action rejects claims 1-11 and 15-17 under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 6,000,287 to Menzel (Menzel). The Office Action took the

position that Menzel disclosed all of the features of claims 1-11 and 15-17. The rejection of claim 2 is moot in light of the cancellation of claim 2, the features of which are incorporated into claim 1.

It is respectfully submitted that Menzel fails to disclose or suggest all of the features recited in claims 1, 3-11 and 15-17. Specifically, Menzel fails to disclose the feature in the capacitive sensor, the capacitance change between the movable electrode in rotational motion and the plate portion is enhanced by means of the shape of the electrodes, as recited in claim 1.

In contrast, Menzel, discloses that the capacitance change is enhanced by changing the stationary electrodes center of area relative to the moveable plate. In other words, the capacitance change is enhanced by changing the position of the stationary electrode and not the shape of the electrodes. See column 1, line 60 – column 2, line 8 of Menzel. Thus, Menzel fails to disclose or suggest all of the features of claim 1 or any of the pending claims.

The Office Action rejects claims 12-14 under 35 U.S.C. § 103(a) as being obvious over Menzel in view of U.S. Patent No. 5,831,164 to Reddi et al.

It is respectfully submitted that the cited combination fails to disclose or suggest all of the features recited in claims 12-14. Specifically, Menzel is deficient at least for the same reasons discussed above regarding claim 1 and Reddi fails to make up for these deficiencies. Reddi is relied upon to suggest the feature that a pair of electrodes may be of any shape. The Office Action cites column 6 lines 30-31 of Reddi.


As discussed above, the cited combination fails to disclose or suggest all of the features recited in claims 12-14. Accordingly, withdrawal of the rejection of these claims under 35 U.S.C §103(a) is respectfully requested.

It is further submitted that each of claims 1 and 3-17 recite subject matter which is neither disclosed nor suggested in the cited prior art. Accordingly, it is respectfully requested that all of claims 1 and 3-17 be allowed, in this application passed to issue.

If for any reason the Examiner determines that the application is not now in condition for allowance, it is respectfully requested that the Examiner contact, by telephone, the applicants' undersigned attorney at the indicated telephone number to arrange for an interview to expedite the disposition of this application.

In the event this paper is not being timely filed, the applicants respectfully petition for an appropriate extension of time. Any fees for such an extension together with any additional fees may be charged to Counsel's Deposit Account 50-2222.

Respectfully submitted,



David E. Brown
Registration No. 51,091

Customer No. 32294
SQUIRE, SANDERS & DEMPSEY LLP
14TH Floor
8000 Towers Crescent Drive
Tysons Corner, Virginia 22182-2700
Telephone: 703-720-7800
Fax: 703-720-7802

DEB:mm

Attachments: Terminal Disclaimer and transmittal
Petition for Extension of Time
Replacement drawing sheets